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February 11, 1993

Jim Williams
Department of the Air Force
Center for Environmental Excellence
Environmental Restoration Division (ESR)
Building 624 West
Brooks AFB, Texas 78235-5000

Subject: F33615-90-4014, Order 04,
O&M Effort for the Bioventing System at the 7th Street BX Service Station
(October through January 1993), Eglin, AFB

Dear Jim Williams:

This letter presents the results of the monitoring effort for the Bioventing System at the 7th Street BX Service Station, over the referenced period. A summary of operation and maintenance efforts performed since October is also included.

If you have any questions please call me.

Sincerely,

ENGINEERING-SCIENCE, INC.

Ola A. Awosika, P.G.
Project Manager

OAA:jw
Attachment

cc/att: D. Downey, ES

AQM01-04-0628

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O&M EFFORT FOR THE BIOVENTING SYSTEM AT THE 7TH STREET BX SERVICE STATION (MAY 1992 THROUGH JANUARY 1993), EGLIN, AFB

OPERATION AND MAINTENANCE

Operation and maintenance (O&M) effort since installation of the bioventing system in May 1992 has included a check on each of the bioventing system components (i.e., blower, gauges, air filter, vapor extraction wells, and injection trenches) to evaluate operating status and to make adjustment where appropriate or necessary. The O&M effort also involved measurement of the following physical parameters:

- Temperature at both blower suction and exhaust;
- Vacuum at air filter;
- Head loss through filter; and
- Pressure at Blower exhaust

May-July, 1992

Over the period May 20 through July 22, 1992 no significant adjustment was made to the system other than increasing the air dilution rate at the air dilution valve on the intake to the blower unit. This adjustment was made to reduce off gas concentration at the injection trenches and to minimize emission of gases into the atmosphere. Prior to making this adjustment a pressure relief valve was installed downstream of the blower. The air filter was changed twice to maximize air flow from the air intake line to the blower and to ensure removal of fugitive materials.

August 1992

Because of continued reports of strong gasoline odor at the gasoline station, a decision was made to replace the existing 2.5 horse power (hp) blower unit being used with a 1 hp unit. On August 3, 1992, the 2.5 hp blower was replaced with a 1 hp blower. A visit to the site on August 20 revealed the blower has not been operating continuously because of power failures associated with frequent storms in the area. A decision was made to rewire the starter for the blower to allow continued operation once power is restored after a storm event. Rewiring of the starter was completed the week ending August 28.

September 1992

An in-situ respiration test was performed on September 2 and 3. The respiration test was performed to ensure that nutrients, moisture, or oxygen are not limiting biodegradation. The respiration test included oxygen and carbon dioxide monitoring over a 24 to 48 hour period. The results of the respiration test were presented in a letter report dated October 7, 1992. Based on the results of this test, a fuel biodegradation rate of 5.36 to 25.85 mg/kg/day was estimated. This variation in the biodegradation rate is related to the location of the monitoring point where the rate was calculated. When compared to rates estimated at startup of system operation, current fuel biodegradation rates are indicative of significant increase in bioactivity and suggest that a more active bacterial population has been established.

October 1992

O&M effort in October involved replacement of the air filter and measurement of physical parameters. A summary of the data gathered since the 1 hp blower was installed is presented on Table 1.

November-December 1992

Monitoring effort in November was delayed to early December (Dec. 3). The test could not be completed because high water table condition prevented collection of representative samples for analysis during the test. Available information indicated that the Eglin area had experienced heavy rainfall during the month of November. Long range weather forecast indicated this high water table condition may continue into the spring. Engineering - Science monitored storm events during December and January to explore possible opportunity to perform the respiration test.

January 1993

An O&M visit was made on January 8, 1993. Water level measurements collected during this visit indicated the high water table condition persisted. However, samples were collected at routine sampling ports (e.g., vapor monitoring points - VMP-1D and VMP-2D, well MW10, and blower suction and discharge). The air filter was replaced with a new part. A repeat of the respiration test may not be possible until the 3rd Quarter O&M effort scheduled for the first week in March.

OVERVIEW OF ANALYTICAL RESULTS

Results of biweekly/monthly concentrations of oxygen, carbon dioxide and Total Hydrocarbons throughout the bioventing system are presented in Table 1 and depicted in the attached charts. These results continued to indicate increased biological activity in the subsurface and suggest potential increase in aerobic bacterial population. Results indicate oxygen supply to the subsurface has been adequately sustained. Notably, preventing condition indicated a soil oxygen concentration of zero at VMP-1 and VMP-2. As of January 8, oxygen concentrations at monitoring locations VMP-1, VMP-2 and MW-10 have increased to values ranging from 16.5 to 20.5 percent. In contrast, carbon dioxide which was in excess of 15 percent prior to startup has declined to values ranging from 2.0 to 8.0 percent at all monitoring points. Available data indicate a rapid decline in total hydrocarbon concentration over the past two months (December and January). Volatilization and to a greater extent biodegradation are believed to be responsible for the total hydrocarbons removed.

TABLE 1
RESULTS OF SOIL GAS ANALYSES
DURING BIOVENTING (5/20/92 - 1/08/93)
AT 7TH STREET BX SERVICE STATION
EGLIN AFB

Location	Baseline(1)			1st Week(2)			3rd Week		
	TH	O ₂	CO ₂	TH	O ₂	CO ₂	TH	O ₂	CO ₂
	ppmv	%	%	ppmv	%	%	ppmv	%	%
Air Discharge to Injection Trench	-	0.0%	> 15.0%	12,000	20.0%	0.6%	5,800	20.3%	0.7%
Inflow into Blower	90,000	0.0%	> 15.0%	-	-	-	-	-	-
VMP-1D	-	0.0%	> 15.0%	-	-	-	680	0.7%	12.1%
VMP-2D	-	0.0%	> 15.0%	-	-	-	> 20,000	17.6%	1.8%
MW10	-	0.0%	> 15.0%	-	-	-	320	20.5%	0.5%

(1) - Baseline background conditions were: Oxygen - 20.4%, Carbon Dioxide - 0.6%.

(2) - Week since start-up of system operation

TH - Total Hydrocarbons

ppmv - parts per million by volume

TABLE 1 - Continued
RESULTS OF SOIL GAS ANALYSES
DURING BIOVENTING (5/20/92 - 1/08/93)
AT 7TH STREET BX SERVICE STATION
EGLIN AFB

Location	5th Week			7th Week			9th Week			11th Week		
	TH ppmv	O ₂ %	CO ₂ %	TH ppmv	O ₂ %	CO ₂ %	TH ppmv	O ₂ %	CO ₂ %	TH ppmv	O ₂ %	CO ₂ %
Air Discharge to Injection Trench	2,400	20.6%	0.5%	3,000	20.1%	0.7%	720	20.0%	3.0%	-	-	-
Inflow into Blower	15,600	17.1%	3.2%	14,200	17.1%	3.6%	10,800	16.3%	3.8%	-	-	-
VMP-1D	220	18.7%	2.2%	396	13.2%	5.9%	540	9.8%	8.1%	-	-	-
VMP-2D	> 20,000	15.0%	3.8%	> 20,000	17.6%	2.1%	> 20,000	14.0%	3.7%	-	-	-
MW10	18,800	19.5%	1.3%	10,000	19.8%	0.8%	8,600	19.4%	1.4%	-	-	-

TH - Total Hydrocarbons

TABLE 1 - Continued
RESULTS OF SOIL GAS ANALYSES
DURING BIOVENTING (5/20/92 - 1/08/93)
AT 7TH STREET BX SERVICE STATION
EGLIN AFB

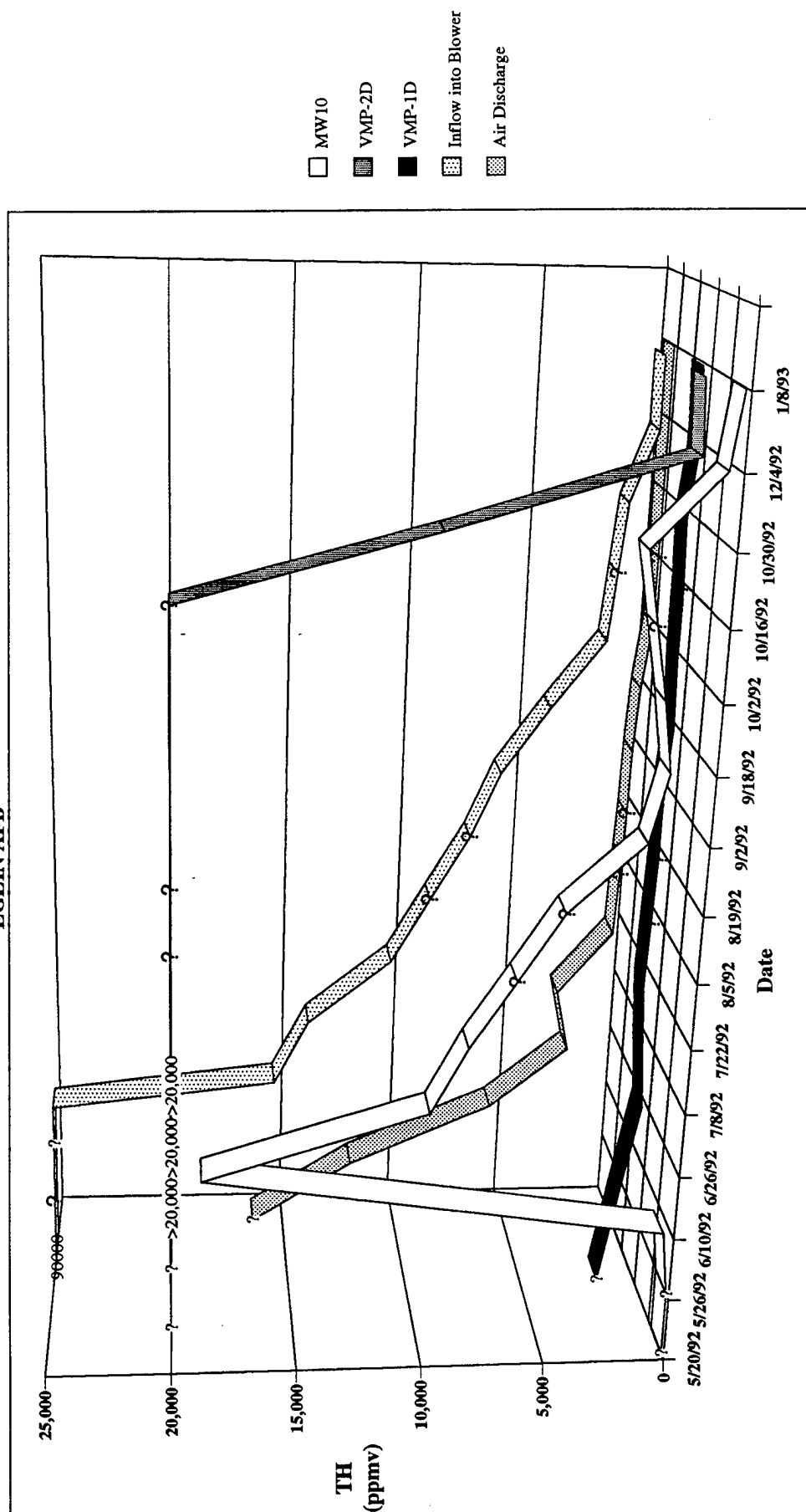
Location	13th Week			15th Week			17th Week			19th Week		
	TH	O ₂	CO ₂	TH	O ₂	CO ₂	TH	O ₂	CO ₂	TH	O ₂	CO ₂
	ppmv	%	%	ppmv	%	%	ppmv	%	%	ppmv	%	%
Air Discharge to Injection Trench	-	-	-	480	20.5%	0.4%	340	20.0%	0.5%	20	20.5%	11.0%
Inflow into Blower	-	-	-	6,550	14.5%	3.2%	4,600	15.0%	4.0%	2,500	18.5%	7.5%
VMP-1D	-	-	-	390	8.0%	6.5%	200	9.5%	6.0%	300	5.5%	0.5%
VMP-2D	-	-	-	> 20,000	5.5%	3.5%	> 20,000	11.0%	2.8%	> 20,000	10.0%	2.5%
MW10	-	-	-	2,200	19.5%	1.2%	1,600	19.0%	1.5%	2,000	20.0%	0.5%

TABLE 1 - Continued
RESULTS OF SOIL GAS ANALYSES
DURING BIOVENTING (5/20/92 - 1/08/93)
AT 7TH STREET BX SERVICE STATION
EGLIN AFB

Location	21st Week 10/16/92			23rd Week 10/30/92			28th Week 12/4/92			33rd Week 1/8/93		
	TH ppmv	O2 %	CO2 %	TH ppmv	O2 %	CO2 %	TH ppmv	O2 %	CO2 %	TH ppmv	O2 %	CO2 %
Air Discharge to Injection Trench	-	-	-	35	21.0%	1.0%	10	21.0%	0.5%	34	20.5%	1.0%
Inflow into Blower	-	-	-	2,000	20.5%	1.2%	1,000	20.5%	0.1%	998	19.5%	4.0%
VMP-1D	-	-	-	360	10.0%	8.5%	80	21.0%	0.1%	200	16.5%	8.0%
VMP-2D	-	-	-	> 10,000	20.0%	2.0%	650	21.0%	0.9%	800	20.5%	2.0%
MW10	-	-	-	3,000	20.0%	2.0%	400	21.0%	0.2%	68	20.5%	2.0%

* - High water table conditions observed.

TOTAL HYDROCARBON LEVELS DURING BIOVENTING AT 7TH STREET BX SERVICE STATION (5/20/92 - 1/8/93) EGLIN AFB



Note: "?" indicates no data was recorded on this date; slopes are assumed to be linear.

CARBON DIOXIDE LEVELS DURING BIOVENTING AT 7TH STREET BX SERVICE STATION (5/20/92 - 1/8/93) EGLIN AFB

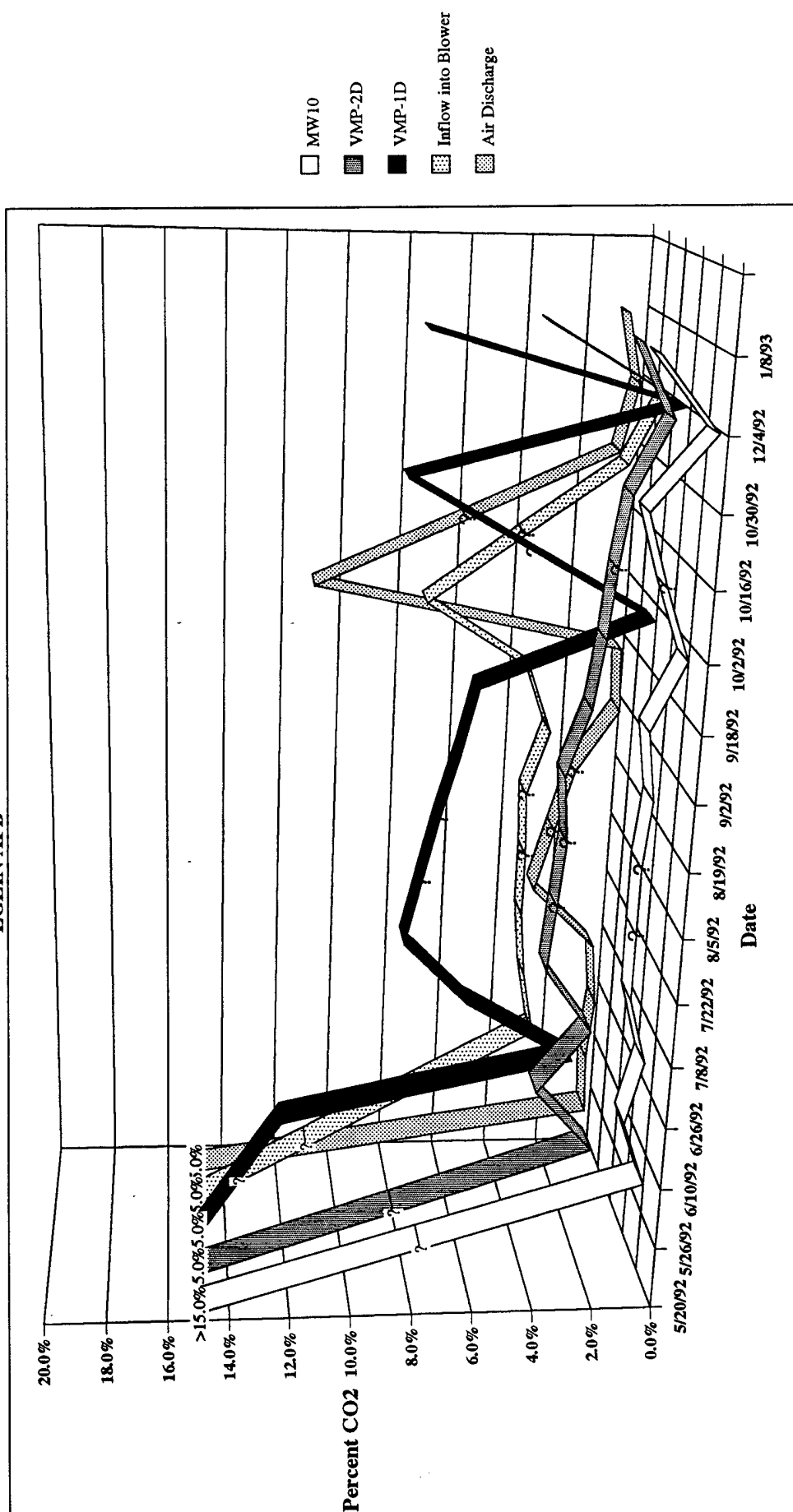
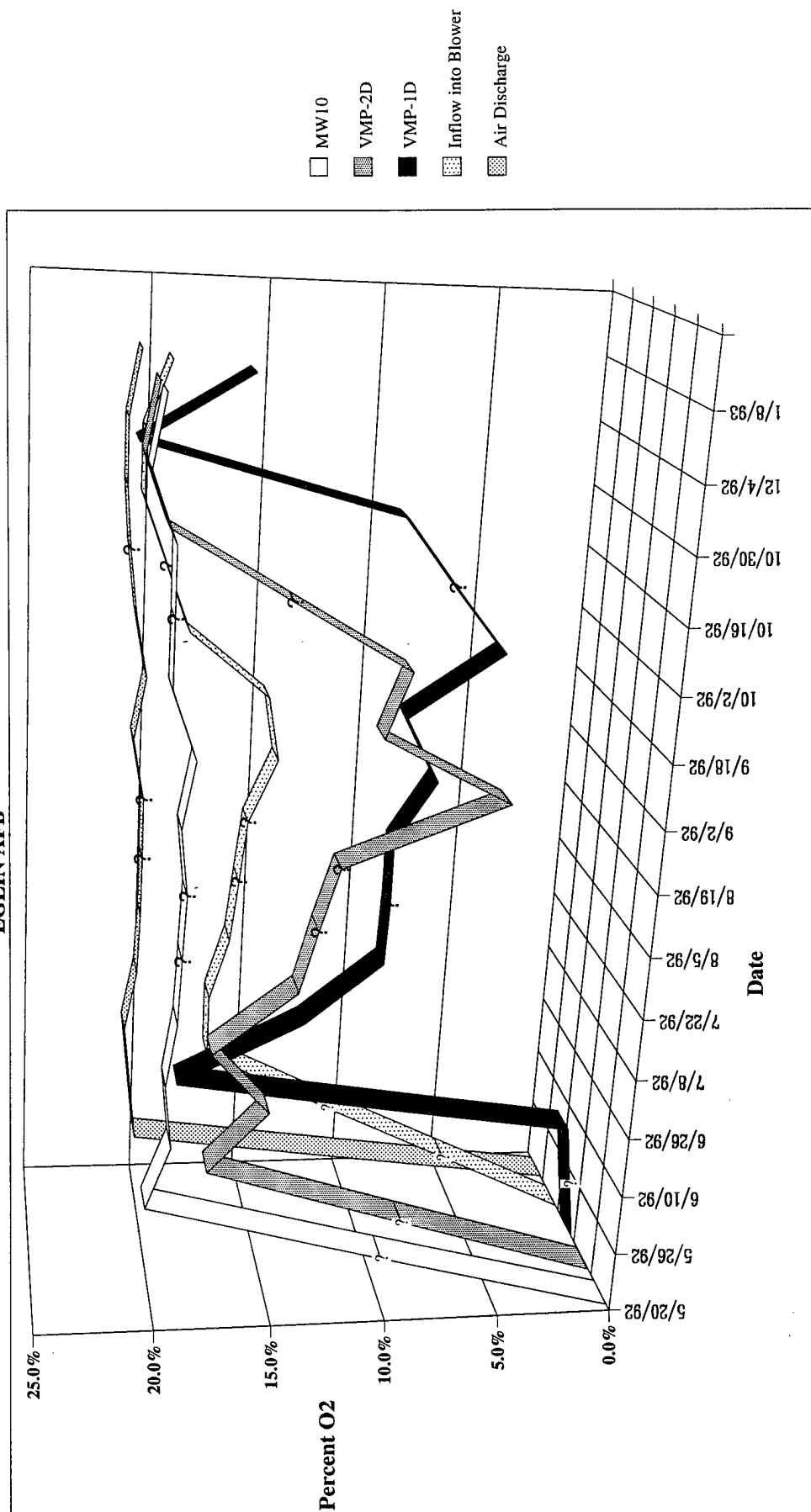


Figure 1

Note: "?" indicates no data was recorded on this date; slopes are assumed to be linear.

OXYGEN LEVELS DURING BIOVENTING AT 7TH STREET BX SERVICE STATION (5/20/92 - 1/8/93) EGLIN AFB



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